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Educational Research Bulletin

SUGGESTIONS FOR TEACHING IX-B ALGEBRA

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This paper is written after an examination of a IX-B algebra test given under the auspices of the Cleveland Mathematics Club. Two kinds of material were placed in my hands. The first was the test itself, which consisted of ninety-eight exercises covering with some completeness the usual algebra course through simultaneous linear equations. Along with the test was reported the number of pupils who attempted each exercise, and the percent of pupils who got it right. The second kind of material consisted of the pupils' papers submitted by four IX-B classes. The total number of papers—excluding a few written by pupils who were absent at some of the test periods—was 112. Accordingly, what I shall have to say will be based upon two considerations: first, a study of the test paper itself; second, a study of the pupils' answer papers.

A Study of the Test Paper

The run of the figures makes it evident that in some instances a large number of pupils omitted a given exercise. Apparently this does not arise from absence because it frequently happens that the exercises immediately before and immediately after the one which shows a small number of "attempts" were tried by a much larger number of pupils. Two suggestions are made in this connection: first, that in subsequent testing under these auspices pupils be directed to try all the examples and problems; and second, that when this precaution has been taken, omitted problems—unless the child is absent—be scored as wrong.

The point I have in mind is that unless these precautions are taken the percents correct are not accurately comparable. If, on the one hand, they are based upon the total number of pupils present they probably represent the problems as more difficult than they really are. If, on the other hand, they are based on the number of children who actually attempted each problem they represent the problems as easier than they really are. I am told that these discriminations were duly considered in making up the tabulations and that the percents as reported are in reality reasonably consistent.

If such is the case there are some surprises in the percentage figures. For example, it is almost as hard to combine the terms of the expression $x-2x$ (85 percent correct) as it is to perform the following addition (82 percent correct):

$$\begin{array}{r} 7x^2-2x+3 \\ 8x^2+2x-9 \\ \hline \end{array}$$

It is considerably harder to subtract in the example,

$$\begin{array}{r} -6 \\ +8 \\ \hline \end{array}$$

than to subtract in the following example,

$$\begin{array}{r} 7a^2+8a-3 \\ 7a^2+10a+4 \\ \hline \end{array}$$

The first of these was worked correctly by 63 percent of the children and the second, by 76 percent. Again only 75 percent of the children obtained the right answer in multiplying a^6 by a while 80 percent were correct in multiplying $(x+6)$ by $(x+8)$. Apparently as soon as one inserts minus signs in an example like the one just mentioned the difficulty is considerably increased. Only 68 percent of the pupils were right in multiplying $(b—4)$ by $(b—6)$.

The use of letters instead of numerals is recommended in some of the verbal problems. As a *testing* device the requiring of the pupils to write the proper equation instead of carrying the problem to a solution may also be commended. As a *teaching* device, however, I should seldom use this abbreviated response to problem situations. In the first place, the pupil should have the satisfaction of getting the answer. In the second place, if he obtains an answer he can check his work by seeing whether the answer fits the wording of the problem.

I suggest the desirability of an experiment to find out how much more difficult problems are when the numbers are expressed in letters than they are when numerals are used. For this purpose the problems should be identical in all other respects. There should be enough of them so that direct recall is precluded. One-half the pupils should solve the literal problems first and the other half, the numerical problems first. The conditions necessary for an experiment of this sort are not difficult to set up.

I cannot avoid referring to the unreality of the verbal problems in the test. We are hearing a great deal about this in arithmetic. We should hear more about it in algebra. Consider this problem:

> The length of a schoolroom exceeds its width by 2 feet. The distance around the room is 76 feet. Write the equation needed to find the width of the room.

The unreality here is due to the fact that you would be extremely unlikely to know the distance around the room without knowing both its length and width; and to the further fact that you would scarcely know the length exceeded the width by two feet without knowing both these dimensions.

TABLE I. TYPICAL CASES OF DIFFICULTY RECOGNIZED IN NUMERICAL RELATION OF MINUEND AND SUBTRAHEND

SIGNS	NUMERICAL RELATION OF MINUEND TO SUBTRAHEND		
	M>S	M<S	M=S
+ expressed			
p.....	+7*	+3*	+4
p.....	+5	+8	+4
p.....	+7*	+3	+4
n.....	−5	−8	−4
n.....	−7	−3*	−4
p.....	+5	+8	+4
+ omitted			
p.....	7	3	4
p.....	5	8	4
p.....	7	3	4
n.....	−5	−8	−4
n.....	−7	−3	−4
p.....	5	8	4
n.....	−7	−3	−4
n.....	−5	−8	−4

NOTE.—Starred examples are represented in the test p=positive, n=negative, M=minuend, S=subtrahend.

A splendid project for a group of persons interested in studying the teaching of mathematics would be to devise a set of, say, five hundred problems in algebra which have real interest and represent life situations. Such material would be of inestimable value in the classroom. Moreover, it would be an

effective rejoinder to the critics of algebra as a high-school subject.

The comparative study of the difficulty of exercises on this test suggests a lack of attention to the fundamentals in algebra. The handling of monomials in each of the four operations is of more consequence than is generally recognized by high-school teachers of mathematics. In algebra it is almost as important to know how to add, subtract, multiply, and divide monomials as it is in arithmetic to know such facts as, 7 and 2 are 9, or 8 times 4 are 32.

It may, therefore, be instructive to consider what the teaching of monomials in a given operation involves. I choose subtraction as the operation to consider. The material which follows is a logical, not an experimental, analysis of the subtraction of monomials. Consideration is limited to integral expressions and to those which are similar. In Tables I and II the starred examples are the only ones represented in the test material.

DIFFICULTY ANALYSIS OF THE SUBTRACTION OF SIMILAR INTEGRAL MONOMIALS

A. Numerals.—Twenty-one typical cases of difficulty were recognized in the consideration of the numerical relation of the minuend to the subtrahend. These are summarized in Table I. From the note following the table it appears that the starred examples are represented among those of the test.

B. Literal quantities, one letter, no expressed exponent.—Forty-eight possible types of difficulty were found in problems containing one literal quantity with no expressed exponent. These are given in Table II. The starred examples, again, are represented among the problems of the test.

C. Literal quantities, two or more letters, no expressed exponent.—The forty-eight cases referred to in Section B are also insignificant here. Probably we can rely on transfer. In that event, these cases do not need to be distinguished. It will only be necessary to introduce, as part of B, examples involving *ab*, *gt*, *xyz*, and others. The point, however, should be established by experiment, as it easily can be.

D. Literal quantities, one letter, with an expressed exponent greater than 1.—Again there are forty-eight cases whose data are similar to those given in Table II. These cases are not as fundamental as those listed under A and B, but they are likely to be more so than those under C. It should be established by experiment whether transfer from knowledge of A and B to knowledge of D can be relied upon. After pupils have had the rule for exponents in division they sometimes subtract exponents in subtraction. There is no opportunity for this on the test, but on the 112 papers examined there are 61 instances of the analogous error of adding exponents in addition, for example,

$$\begin{array}{r} 3x^2 \\ 2x^2 \\ \hline 5x^4 \end{array}$$

Tentatively, therefore, and in the absence of experimental evidence, I am inclined to recognize the forty-eight cases under this heading as worthy of some special treatment—especially after division has been taught.

E. Summary.—In the subtraction of similar integral monomials there are apparently sixty-nine difficulties (and perhaps one hundred and seventeen) which are sufficiently different to be recognized apart from each other. Experimentation should go forward to determine how difficult each of these cases is, the extent to which transfer from one case to another occurs, and the extent to which all the cases may be merged into one case as covered by the rule "change the sign of the subtrahend and add."

The characteristics by which cases have been distinguished in the above analysis are:

1. Whether the expressions are numerals, namely, arithmetical numbers, or contain one or more literal factors.
2. The signs of the minuend and subtrahend.
3. The size numerically of the minuend in relation to the subtrahend.
4. The unexpressed coefficient "1" in minuend, subtrahend, or difference.
5. The number of letters involved in each expression.
6. The presence of one or more exponents.
7. The unexpressed plus sign.

Among the sixty-nine cases shown in Tables I and II, only six are represented in the IX-B algebra test. Perhaps one could not expect an extensive treatment of this small corner of elementary algebra. But in planning the testing program, teachers and heads of departments should provide an abundance of drill and test material on monomial work. I am convinced it is sadly neglected in all four operations. The response of pupils in this type of work should be as little subject to error as in the basic number facts in arithmetic. If, in subtraction, more

TABLE II. TYPES OF DIFFICULTY IN PROBLEMS CONTAINING ONE LITERAL QUANTITY WITH NO EXPRESSED EXPONENT

SIGNS	RELATION OF COEFFICIENTS							
	* M>S	* M<S	M=1 S>1	M>1 S=1	† M=S	M=S =1	D=1 +	D=1 −
+expressed								
p	+7b	+3b	+ b*	+3b	+4b	+b	+7b	+6b
p	+5b	+8b	+6b	+ b	+4b	+b	+6b	+7b
p	+7b	+3b	+ b	+3b	+4b	+b		
n	−5b	−8b	−6b	− b	−4b	−b		
n	−7b	−3b	− b	−3b	−4b	−b		
p	+5b	+8b	+6b	+ b	+4b	+b		
+ omitted								
p	7b	3b	b	3b	4b	b	7b	6b
p	5b	8b	6b	b	4b	b	6b	7b
p	7b	3b	b	3b	4b	b		
n	−5b	−8b	−6b	− b	−4b	−b		
n	−7b	−3b*	− b	−3b	−4b	−b		
p	5b	8b*	6b	b	4b	b		
n	−7b	−3b	− b	−3b	−4b	−b	−6b	−7b
n	−5b	−8b	−6b	− b	−4b	−b	−7b	−6b

NOTE.—Starred examples are represented in the test: p=positive, n=negative, M, S, and D refer to the coefficients of the minuend, subtrahend, and difference respectively.

* D not equal to 1. † M not equal to 1.

than one-quarter of our pupils fail on the example

$$\begin{array}{r} +12 \\ -\ 8 \\ \hline \end{array}$$

and more than one-third of them on

$$\begin{array}{r} -6 \\ -8 \\ \hline \end{array}$$

—and this is the showing of the test on these examples—then we are building on an insecure foundation.

F. Further items of difficulty.—No reference is made in the above analysis to the way in which subtraction of monomials may be expressed. Among little children who are learning the simple subtraction facts, we find that confusion and difficulty result if at one time we express the minuend first and at another time the subtrahend. It is doubtless the same with children in the eighth and ninth grades. On the test, for example, 82 percent of the children got the right answer to, "From $-8x$ subtract $12x$"; but only 75 percent of them got the right answer to, "Subtract $12a$ from $-8a$." This is the same example barring the use of a in one case and x in the other. Moreover, when the subtrahend was named first, the run of the figures suggests that fifty or sixty pupils did not attempt it.

Suppose the same sort of an example were expressed this way: "How much more is $-8x$ than $12x$?" Our figures for difficulty when obtained from a different form of expression would be of little help to us. The same would be true of other ways of saying the same thing, such as, "How much less is $12x$ than $-8x$?" In this connection the whole matter of cues comes in for consideration. We have evidence that pupils often decide how to proceed not from a consideration of the entire problem situation but rather from certain occasional words or phrases. Thus "in all" means add, and so does "more." "Have left" or "were left" means subtract, while in fractions "of" means multiply. These cues are very treacherous. "More" often means subtract. "In all" may have no reference to addition. Even so reliable a cue as "from" indicating the minuend in subtraction may fail the pupil, for example, "Little Boy Blue slept under the haystack from two o'clock to five o'clock. How long did he sleep?" Accordingly it will make a great deal of difference how subtraction is expressed. We should know something about these difficulties due to the form of expression. This is suggested as a research topic.

Again, the above analysis takes no account of zero either in the minuend or in the subtrahend. Yet there is constant need in algebra for subtracting a number from zero or for subtracting zero from a number. The twentieth example of the test calls for the subtraction of a polynomial from a polynomial. In the process, $-2y^2$ is to be taken from zero. One-fifth of the children who attempted this example got it wrong. If I may judge from the 112 papers I have had examined, practically all these pupils made a mistake in subtracting $-2y^2$ from zero.

My experience leads me to believe that we do not, either in arithmetic or in algebra, teach the meaning and use of zero as carefully as we should. It is just as real a number as 5 or 10 or —20. To neglect it is poor pedagogy and poor mathematics.

Several projects.—The following research problems are suggested:

1. An analysis into unit skills or difficulties of one or more topics in algebra.

2. A trial of these items—submitting them to test with children—to see which of the items have real difficulty.

3. The devising of test and drill material on the more difficult items.

4. The organizing of a teaching program for the topic in question which shall take account of the various difficulties or unit skills involved in the topic.

A STUDY OF PUPILS' ANSWER PAPERS

As I have already indicated, 112 pupils' papers were submitted to me for examination. On these papers all wrong answers were noted and many errors were transferred to cards. I cannot in the time at my disposal indicate more than a small portion of the analyses of these errors. In the following summary certain type errors are listed. A type error is merely one which is frequently made in the same way. Among these twenty-six errors in this list there are, however, a few whose frequency is not high. They are included because they have some interest apart from high frequency of occurrence. I suppose that in the division of monomials as much attention is given to the law of exponents as to any other single item. Yet only two of these 112 pupils failed to subtract exponents. Accordingly, this error is included not because it is frequent, but because it is thought to be a common error when in reality it is not.

The errors listed below were taken for the most part from the simpler exercises among the ninety-eight included in the test. It is believed that the frequency with which these errors occurred will repay study. It is also believed that they tell their own story as to the emphasis which the teachers of these classes at least and probably the teachers of other classes should make.

The following errors and frequencies of occurrence were found:

ADDITION	FREQUENCY
Subtracted when signs were like	29
Added when signs were unlike	28
Added exponents	61
Added dissimilar terms	11
Wrong operation (multiplication)	23
SUBTRACTION	
Subtracted when signs were unlike	34
Added when signs were like	69
Dropped exponents	11
MULTIPLICATION	
Failure to add exponents	20
Like signs made to yield minus	2
Addition of coefficients	30
Multiplication of exponents	2
Failed to multiply both terms of binomial by coefficient	3
Wrong operation (addition)	52
DIVISION	**FREQUENCY**
Failure to recognize that a quantity divided by itself gives 1	37
Failure to subtract exponents	2
Failure to multiply all terms of divisor by term of quotient (long division)	7
Error in calculation	60
Error in sign (operation correct)	262
Insertion or omission of letters	30
Error in copying problem	5
Failure to recognize that x means $1x$	16
Confusing exponents and coefficients	111
Inadequate knowledge of operations	20
Failure to change sign in transposing	30
Failure to change signs within a parenthesis preceded by a minus sign	47

WHAT KNOWLEDGE OF ARITHMETIC IS NEEDED

I have found the reaction of pupils to exercise 77 so interesting that I shall confine what I have to say under this head to the material I find on the pupils' papers concerning this exercise and to the inferences which seem to me to be justified.

Exercise 77 reads, "Find the value of $\frac{x}{y}+\frac{y}{x}$ when $x=2$ and $y=3$." Among the 496 pupils who tried this, only 212 got it right. The trouble was in *addition of fractions*. Nearly everybody made the correct substitution thus getting $\frac{2}{3}+\frac{3}{2}$. The commonest answer was 1. It was obtained by cancellation, as if the required operation was the multiplication of $\frac{2}{3}$ and $\frac{3}{2}$ instead of addition of $\frac{2}{3}$ and $\frac{3}{2}$. The next most frequent error was a failure even to attempt to add the fractions. Pupils who made this error left the matter as $\frac{2}{3}$ and $\frac{3}{2}$. Others had less frequent errors. A few got zero as the result of adding $\frac{2}{3}$ and $\frac{3}{2}$. They cancelled as in multiplication but regarded complete cancellation as meaning zero instead of 1. One pupil had a privately operated rule. According to him you add fractions by multiplying your numerators for the numerator of the answer and your denominators for the denominator of the answer. Thus he obtained $\frac{6}{6}$ for his answer. Five pupils cross multiplied and came out with 4+9 or 13 as the sum of these two fractions.

Sixty-seven pupils in these classes got this example wrong. Forty-nine of them

did, because they did not know how to add fractions in arithmetic. Five others probably had the same trouble. I cannot be certain—but my best guess is that when a pupil, for example, gets 2½ as the sum of ⅔ and ⅝, he does it by some hocus-pocus involving a highly original way of adding the fractions. This makes fifty-four pupils out of sixty-seven whose inability to do this example in substitution was due to their inability to perform an operation they learned in the fifth grade. Of the remaining thirteen pupils, three had sporadic or meaningless errors. Only ten had errors which indicated an inability to substitute numerical for literal values.

Fifty-four pupils failed to do this example because they did not apply an ability which they *learned* in the fifth grade. Learned is the word. You may think they did not learn how to add fractions; but you are probably wrong in that inference. All you are justified in saying is that these pupils did not—and hence probably could not—add ⅔ and ⅝ at this moment and in this situation. How many of you who studied Caesar and passed a creditable examination in second-year Latin could do so now? Only those who have, as we say, "kept up" their Latin.

To what extent has the pupil in the ninth grade kept up his knowledge of how to add fractions? To what extent has there been any occasion to do so? Probably very little. What course of action does the fact dictate? Clearly it means you should first find out whether or not the pupils can add fractions—or perform any other skill which the teaching unit you are about to enter upon will require. If they cannot, your second step is to teach *them what they need.* The very worst thing you can do is to stick your head in the sand and pretend that the children can do what as a matter of fact the very laws of learning make it unlikely that they can do. The next worst thing to do is to berate the teachers of the elementary school, because they did not teach addition of fractions. They did. They may have done a poor job, but the unsatisfactory results attained at this moment by these pupils is no proof of it any more than the failure of one of your pupils to solve correctly a quadratic equation in college physics is proof that you did not do a good job of teaching quadratics. The onset of oblivescence will obscure the learning of most things after a sufficient lapse of time.

The psychologist has developed two ways of measuring learning, and it seems to me that in our teaching, we should recognize both of them. One of these is the errorless response, and this is the measure which the teacher uses particularly for the purpose of criticising pupils or their previous teachers. If the pupil adds his fractions, he can add fractions; if he does not, he cannot. Perfectly simple, but far from satisfactory. The second measure of learning is the effort required to relearn. Effort may be measured by the time or the number of repetitions. This measure of relearning should be made a part of the teacher's thinking. The task is to analyze the difficulties of algebra as a whole or of a topic in algebra and to provide for all of them. If addition of fractions in arithmetic is one difficulty—and it certainly will be in every situation where it arises—then this fact must be faced. A quick review and a little drill will solve the difficulty for nearly everybody. Moreover, progress will be more rapid. Being able to concentrate on the one new difficulty you will be able to give it more satisfactory treatment.

Such a procedure will be in accord with the psychology which we all learned in college or normal school but which we are far less able to apply than our pupils are to apply their previous knowledge of arithmetic. We shall not make the naïve and irritating assumption that because a pupil cannot now do a thing he never learned it. He is probably only "out of practice." I remember

when I was a boy the theory was that if you learned a thing you would never forget it. Moreover, you would be able to recognize this particular thing in a new setting. If at any time or anywhere you failed to say the proper words or make the correct response then you had not learned the thing in the first place. It was a cruel doctrine and a false one. It is still practiced.

A far better procedure—one which is more human, more effective, and closer to the facts—is first to learn what the difficulties are in a given teaching unit—you owe it to your self-respect to know your job well; second, to test your pupils on such of these difficulties as are prerequisite to the new matters you are to teach; and third, to provide for the relearning—or for the original learning—of these difficult items.

(*Continued on page 260*)

THE ABILITY TO FOLLOW ORAL AND WRITTEN DIRECTIONS

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In an earlier paper[1] the writer has presented evidence to show that with adult students, for meaningful material to be completely learned, the auditory method of presentation is as effective as the visual method so far as ease of learning is concerned and probably is superior for retention. This, remember, is contrary to the customary belief that while the auditory method is superior for young children it gives way to the visual method later on.

Although the study mentioned above was perhaps of small direct value since so little material is, in schools, learned verbatim, it was suggestive, particularly in the light of some recent tendencies in educational procedure, such as credit-earning courses by radio—now offered by several universities—and educational[2] and intelligence[3] tests presented orally. Nevertheless, it is obviously desirable, before such schemes are generally adopted, to investigate in more common situations the adequacy of the method of presentation. A little evidence is at hand. For example, Burtt and Dobell[4] have noted that for certain materials the auditory method compares very favorably with the visual method.

In the present study an attempt was made to discover the relative accuracy of performance in following directions after a single presentation by the visual and the auditory methods. For this experiment, Test 1, Form 5, of the Army Alpha examinations was used. The oral presentation was according to the directions given in the manual of instructions for use with these tests. The technique of the visual presentation was as follows: The directions for each exercise were typed on a slip of paper. The slips were then assembled and stapled, making a little packet. In this way the directions for only one exercise were visible at any one time. The wording of the directions for each exercise was as nearly as possible like that given in the auditory presentation, for instance, the regular oral directions for exercise 7 are: "Attention. Look at 7. When I say 'Go' cross out the letter just before C and also draw a

(1) Worcester, D. A. "Memory by Visual and Auditory Presentation," *Journal of Educational Psychology*, 16:18-27, January, 1925. In this article there are also references to previous studies on the subject.

(2) Buckingham and Stevenson, Place Geography Tests.

(3) Chapman, J. Crosby. "A Group Intelligence Examination without Prepared Blanks," *Journal of Educational Research*, 11:269-79, April, 1925.

(4) Burtt, H. E. and Dobell, E. M. "Curve of Forgetting for Advertising Material," *Journal of Applied Psychology*, 9::5-21, March, 1925.

line under the second letter before H. Go." The typed directions read: "Now look at 7. When you have read this, cross out the letter just before C and also draw a line under the second letter before H. Go." In no case did the total number of words by the two methods vary more than one and in many cases the number was the same. Those taking the test by the visual method were instructed to read the directions carefully just once, then turn back the slip, perform the exercise called for, then read the next set of directions and so on. In spite of the warning several admitted later that they had read some of the directions more than once. No time limit was imposed on those reading the directions. This was probably of no significance as the regular method allows ample time to those able to succeed at all. Any advantage from lack of limits would, of course, favor those reading.

TABLE I. VISUAL VERSUS ORAL PRESENTATION IN THE ARMY ALPHA EXAMINATION

NUMBER OF EXERCISES CORRECTLY PERFORMED	NUMBER OF CASES TESTED	
	Visual Presentation	Oral Presentation
11	7	8
10	21	37
9	15	36
8	16	29
7	10	13
6	7	4
5	6	0
4	6	0
3	2	1
1	2	0
0	0	0
Total	92	128
Median	8.81	9.47
Mean	7.891	8.844
S. D.	2.265	1.315
P. E. mean	.159	.078
P. E. diff. mean	.177	

The test was given to four sections, 220 students, of a class in Freshman Survey at the Kansas State Teachers College of Emporia. Two sections, one by each method, were tested in the forenoon, and two, one by each method, in the afternoon. Two examiners, both experienced, were used, each examiner conducting one test by each method. As a typographical error was found in the tenth exercise, that item was neglected in the scoring of all tests, and the results here given are for the eleven exercises correctly presented by each method.

RESULTS

The results of the experiment are shown in Table I. Using the formula

$$\frac{M-M}{\text{P. E. diff. mean}} = \frac{.953}{.177}$$

the value 5.381 is obtained indicating that the chances are over 1,310 to 1 that the superiority of oral presentation is not merely due to chance.

CONCLUSIONS

It is seen that the auditory method seems to be slightly but consistently the better method of presenting directions of this sort. It is to be remembered, too, that any advantage of method was in favor of visual presentation. This finding, together with such other evidence as mentioned above, would appear to justify from a psychological viewpoint the various devices for oral presentation of educational material. The evidence suggests, also, that the casual training experience, even of the adult, is of a more auditory nature than has been realized and that the school may do well to exploit this method. It would follow, of course, that attention should be given to the systematic training of auditory perception. The peculiar advantages of visual presentation for certain materials is recognized. The point here made is merely that the values of the auditory method are also worth preserving.

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EDITORIAL

At the first Lincoln-Douglas debate, Judge Douglas repeatedly and sarcastically referred to his awkward rival for senatorial honors in terms of mock respect. In particular he referred to him frequently as "the amiable gentleman from Sangamon County." The next week when the debaters met again, Lincoln alluded to these irritating pleasantries. He admitted, however, his liking for flattery. In fact, he said that in regard to flattery he was a good deal like the Hoosier in regard to gingerbread. The Hoosier declared that he liked gingerbread better than any other man in the world and got less of it.

We have received many words of praise on behalf of the Bulletin. We enjoy these words, and we are simple enough to believe they are sincere. When, for example, Dr. Stenquist says, "You are putting some great stuff into your little Research Bulletin," we like to think he means precisely what he says. We are loathe to believe that Dr. Bell is merely flattering us when he expresses his "surprise and delight at the collection of good things," found in our Bulletin. We like flattery, to be sure; but we indulge the hope that modicum of these things comes from the heart.

The Bulletin has been appearing now for three and a half years. Today it is being distributed to the offices and homes of six or seven thousand school people who are about to begin the labors of the new school year. It heartens us to realize that our efforts have been appreciated; and if we grow unduly proud, strutting and crowing like the farmyard braggart, you must know that we have had not a little provocation. Some of the comments we have received are ponderously appreciative, such as those which speak of "the splendid contributions" which we are making. Again some of the testimonials read like an advertisement for soap or patent medicine. One says, "In the sixteen years of my school experience, I have enjoyed no journal as much as I have yours." Then there is the teacher who somehow gives us the feeling that our Bulletin is a little fairy in the home. She says, "Your Bulletin is such an inspiration."

We love them all, those words of encouragement. Of course, you realize that we are only raising a screen to prevent your knowing how "tickled" we are at the good words we have received. Not the least of these are the opinions we have received from classroom teachers, opinions which indicate that the Bulletin is of use to them in the schoolroom. One teacher says she could not well give it up, another that he makes use of its suggestions in his classes, a third that he passes it on to another teacher, while a fourth asks why we don't charge him for it.

That last idea is one that we shall shortly have to consider seriously. There isn't enough of the Bulletins to go 'round. This fall we are increasing the number of issues, and we have made substantial increases before. If our friends multiply, something will have to be done to prevent our becoming the victims of our own success.

Meanwhile, as the new school year begins, we wanted to tell you that we shall try to have a better Bulletin this year than ever before and that according to present indications we shall succeed.

THE BUREAU OF EDUCATIONAL RESEARCH

1924-25

Research bureaus of many sorts and with various titles have multiplied rapidly during the last two decades. The activities of most of them may be known by their names, but to many people—some of whom do not know that education has its scientific aspect—the activities of a Bureau of Educational Research are most perplexing. A glimpse at the Report of the Bureau of Educational Research of Ohio State University may throw some light on the ways in which the staff members of such a Bureau occupy their time. There are three distinct groups in the Bureau, their activities being more or less defined by their names, the Research Division, the Reference Division, and the Editorial Division. The Research Division during the past year has included Dr. Buckingham, Dr. Ashbaugh, and Dr. Stevenson, who render full-time service, and Mr. Livingston and Mr. Koch, the research assistants for 1924–25. These men are assisted by several stenographers and a number of part-time student clerks.

The chief interest of the Research Division is a scientific study of educational problems. When a problem is to be considered, a definite method of investigation is determined, a number of school systems are asked to cooperate, and the project is continued for one or more years under the direction of certain members of the staff. More than fifty such projects have been framed during the four years which have elapsed since the organization of this Bureau in 1921. A detailed account of the past year's progress in the various projects is given elsewhere in this number of the *Bulletin*.

Important service is rendered by the Reference Division of the Bureau. The staff consists of three regular members and student clerks. The reference and loan work, and acquisitions to the library have been the special concerns of Miss Voegelein, the reference assistant. The library of the Bureau has been open during office hours to the students of the University. The Bureau members and the professors of the College of Education have had books and pamphlets placed on reserve for the use of their students. Fourteen formal bibliographies have been compiled during the year. Two of the more extensive ones were printed. The acquisitions during the year—books, pamphlets, periodicals, and mimeographed material—have exceeded those of previous years. The number of bound books received was 1,606. Pamphlets and mimeographed materials were received at the rate of about three hundred a month. As has been the custom, this Division had charge of the textbook exhibit held during the Educational Conference. One hundred and forty-four publishers cooperated and gave generously of their books and circulars.

The work of the Editorial Division has been carried on by Miss MacLatchy assisted by Miss Brown, and three part-time clerks. This Division of the Bureau edited the nineteen issues of the *Educational Research Bulletin* for the year, assisted in the work on the *Journal of Educational Research* of which Dr. Buckingham is editor, and assisted Professor MacDonald in the four issues of the *Ohio State Vocational News Items*. The work of collecting and editing the *Proceedings of the Fourth Annual Ohio State Educational Conference* was undertaken by this Division. Two monographs of the Bureau of Educational Research series were likewise put through the press. The Division also assisted in editing three monographs of the *Journal of Educational Research* series—namely, those by W. H. Winch,

F. L. Whitney, and W. W. Coxe. The services of the Division were employed in proofreading the report of the Classification Committee for the State Department of Education. Various other editorial services were performed—such as reading and appraising manuscripts for publication and preparing numerous pieces of material for issuance by the Bureau in typed and mimeographed form.

Outside calls for the advice and assistance of the research members of the Bureau are varied and numerous. A few examples will give the reader an idea of the character of this service. Increased cost of construction, enlarged enrollment, and the more elaborate courses of study, particularly in the high school, have made the erection of a school building an enormous responsibility to the local school board. For this reason, during the past year, many of the school boards of Ohio have sought expert advice from the members of the Bureau staff. Some have brought the proposed plans of their new buildings to the Bureau to be checked; others have asked help in the choice of building sites. The checking of the plans has often required extensive alterations by the architect and many visits to the Bureau on the part of both the architect and the school-board members.

Surveys of the school systems of Bremen, Vermilion, Portsmouth, Lima, Chillicothe, New Lexington, Berlin Heights, Brookfield, Newton Falls, Grandview, and Johnstown have been made during the past year. These have not only involved the survey of the present school plant but have also necessitated extensive studies of population trends and financial resources, in order that building programs utilizing present equipment and planning for future needs might be proposed. Dr. Stevenson has directed this work, assisted by Dr. Ashbaugh, the research assistants, and a number of graduate students.

During the past three years Dr. Stevenson has been collecting data on school publicity. From this material he has been able to make suggections to boards of education regarding methods of carrying on and organizing school-publicity campaigns. Last fall just preceding the elections many cities and districts asked the cooperation of the Bureau in securing additional levies or school bonds. Sixty-two cities and 259 county districts asked for and received such assistance during the year. Much of the work with the county districts was carried on through the county superintendents. Sixty of the eighty-eight counties of Ohio used material which they obtained from the Bureau.

The advice of the members of the Bureau was frequently sought on technical questions of administration, supervision, and teaching. These requests sometimes involved not only appeals for advice on such matters but bibliographies, abstracts, and books also. Such requests were attended to by our Reference Division.

The members of the Bureau staff have also served on many committees and in organizations both state and national. Dr. Buckingham, during the year, brought to a close the activities of the Classification Committee appointed by Superintendent Riegel. The report of the work of the Committee was published and is now in circulation. Dr. Buckingham is also a member of two other committees appointed by Superintendent Riegel, the Economy Committee—a Committee appointed by the State Superintendent to consider ways in which retrenchments may be made by the schools of the state—and also the Advisory Committee for Examining Entrants to Teacher-Training Institutions. Dr. Ashbaugh and Dr. Stevenson devised a rather extensive test for the use of the last-mentioned Committee.

During the year Dr. Buckingham has also been a member of the Educational Council of the State Teachers Association, chairman of the Council's Subcommittee on Educational Resources,

and a member of the subcommittee on the Professional Preparation of Teachers. He was likewise a member of the Division of Psychology and Anthropology of the National Research Council. Dr. Ashbaugh was president of the Educational Research Association and is still a member of the Executive Committee of the Educational Research Association. He is president of the department of Educational Research of the Ohio State Teachers Association. Dr. Stevenson is chairman of the Committee on "Teaching Load in the High School" for the National Association of High-School Principals. Dr. Stevenson also acted as secretary of the Executive Committee for the Fifth Annual Conference. The work in connection with this position occupied a large part of his time during the two months just preceding the Conference.

THE PROJECTS OF THE BUREAU OF EDUCATIONAL RESEARCH FOR THE PAST YEAR

Among the fifty odd projects set up by the Bureau of Educational Research during the four years since its organization, several have been completed during 1924–25. The report of the study of child-accounting records (Project 6) made by Dr. A. O. Heck,[1] research assistant in the Bureau 1923–24, will appear as one of the "Bureau of Educational Research Monographs" and will be in circulation within a few weeks.

The investigation of class-size (Project 1) begun by Dr. Stevenson and Dr. Buckingham at the University of Illinois has been continued at Ohio State University for the past three years. A report of the continued investigation of the size of high-school classes appeared in one of the May issues of this *Bulletin*,[2] and the report for the elementary-school classes will appear in an immediately forthcoming volume of the "Bureau of Educational Research Monographs."

The final report of the study of the value of the kindergarten (Project 3) carried on since 1922 will be prepared during the Fall Quarter.[3] Progress reports of this investigation have already appeared.

Dr. Buckingham's study, The Supply and Demand in Respect to Trained Teachers (Project 7), supported in part by a subvention from the Commonwealth Fund, has been completed, and the report[4] will appear as a monograph in the Bureau series during the Fall Quarter. A progress report of this project has already appeared.[5]

The year's progress in several other studies—Effective Publicity, A Study of Report Cards, One-Room Rural Teachers, Rural High-School Libraries, and School Libraries (Projects 11, 4, 9, 16, and 25)—was reported in a May issue of this *Bulletin*.[6]

Mr. Schrammel's article on "The Administrative Staff of State Departments of Education,"[7] and Miss Tyler's article, "The Latin Infinitive of Indirect Statement in Beginning Textbooks"[8] were each partial reports of Bureau projects. The final report of Mr. Schrammel's investigation has been com-

(1) *The Status of Child-Accounting Records and the Selection of Child-Accounting Systems*. Columbus, Ohio, Ohio State University. On the press.

(2) "More Evidence Concerning Large and Small Classes," *Educational Research Bulletin*, 4:231-33, May 27, 1925.

(3) MacLatchy, Josephine. "The Influence of Kindergarten Attendance on Progress in Grade 1," *Educational Research Bulletin*, 3:361-65, December 10, 1924. Also "The Influence of Kindergarten Attendance on Progress in the First Two Grades" to be published in *Childhood Education*.

(4) "*The Supply of Trained Teachers and the Demand for Them*." Columbus, Ohio, Ohio State University. On the press.

(5) "The Demand for Trained Teachers in Ohio," *Educational Research Bulletin*, 4:221-26, May 27, 1925.

(6) Buckingham, B. R. "A Progress Report on a Few Selected Projects," *Educational Research Bulletin*, 4:226-30, May 27, 1925.

(7) *Educational Research Bulletin*, 4:77-81, February 18, 1925.

(8) *Educational Research Bulletin*, 4:166-69, April 15, 1925.

pleted and accepted as a Doctor's dissertation by the Faculty of the College of Education.

Progress reports of a few other projects will be taken directly from the Director's report to the President of the University. These projects are not yet nearing completion, nor, with two exceptions, has any published report been made of them.

Project 12. Problem scale in arithmetic.—The attempt to ascertain the difficulty of a large number of arithmetic problems has been carried forward this year. Dr. Buckingham gave a report of this project in an article entitled, "Selecting and Evaluating Arithmetic Problems."[1]

Project 2. Departmental teaching.—This project has been carried on at the Murray Hill Elementary School, Cleveland, the object being to determine the relative effectiveness of departmental teaching as compared with the traditional grade plan by which one teacher teaches all subjects in a given grade.

The original experiment extended through two semesters: First, the pupils were divided on the basis of intelligence tests into two groups equal in number and ability. These groups were then subdivided into the Alpha group, on the departmental plan, and the Beta, on the grade plan. At the beginning and end of the year all pupils were given achievement tests from which gains were to be computed. The work on this portion of the experiment was completed in January, 1924. Following the original plan it was determined to continue the Alpha and Beta divisions as before except that both groups should be organized on the departmental plan, the purpose being to obtain data that would serve as a check on the original experiment. Permission was obtained from the Cleveland office and this check experiment was carried out as planned, the final testing being completed in June, 1924.

(1) *Educational Research Bulletin*, 4:34-37, January 21, 1925.

Aside from the procedure already described, over ten thousand papers were scored, the records made, and the scores reduced to a form that would comply with statistical requirements. Individual gains have been computed for each pupil in each subject. The next step will be to compare gains for the two groups. The report of this project will soon be completed. The project is being carried forward by Mr. A. W. Stewart under the direction of Dr. Buckingham.

Project 15. The work of departments of school attendance.—This project was initiated in 1924 and material was received from approximately 150 cities in response to our questionnaire. In addition to analyzing and tabulating the returns, supplementary sources of information, such as state codes and the reports of state departments, have been examined to throw light on the information secured. Dr. Ashbaugh has charge of this project.

Project 30. A study of children's interests as revealed by the questions they ask.—This study is being carried forward by Miss Lou H. Thompson, principal of Fairwood Elementary School, Columbus, under the direction of Dr. Stevenson. She has collected and classified a large number of questions which have been asked by pupils in the elementary schools. A progress report of this study was published in this *Bulletin*.[2]

Project 40. Remedial arithmetic.—Continuing the work done during 1923–24 in remedial arithmetic, several projects were set up. Some subsidiary problems which have been investigated are: increasing the ability of pupils to solve arithmetic problems, the specific causes for failure in arithmetic problems, the value of problems without numbers, the difficulties in arithmetic vocabulary, the variety in problems, the methods of attacking problems, the dramatization in arithmetic, and the assignment of

(2) "Children's Questions," *Educational Research Bulletin*, 3:347, November 26, 1924.

lessons on arithmetic problems. These various problems have been studied by a group of Columbus teachers under the direction of Dr. Stevenson. The report of this investigation appeared as a special number of the *Educational Research Bulletin* dated October 15. So many requests were received for additional copies of this report that an extra edition of three thousand was printed, and a charge of ten cents per copy was made. This additional supply is almost exhausted. Several magazines asked for the privilege of copying one or more of these articles and at least one reprinted the entire bulletin.[1]

Project 48. Score cards for school buildings.—Dr. Stevenson and Dr. Ashbaugh have devised a score card for judging rural-school buildings which does away to a large degree with the necessity of subjective judgment. This score card was devised in tentative form and a preliminary edition printed. Copies were then sent to representative rural-school people including county superintendents, rural supervisors of state departments, and teachers of rural education in colleges of education throughout the country with requests for criticism. Replies were received from thirty different states. Many of the men asked for a sufficient number of the score cards to distribute among the members of their summer-school classes and to teachers in service in order to test the usability of the card. On the basis of this extensive use and the criticisms received, the card has been revised and is now being published by the Public School Publishing Company.

A revised score card for elementary-school buildings.—Under the auspices of the Bureau of Educational Research a number of surveys of village and city schools are made each year. No existing score card for elementary-school buildings has been found which will measure Ohio buildings in a satisfactory manner. Dr. Stevenson has devised a score card which has been used in preliminary form in three city surveys, Chillicothe, Portsmouth, and Lima. Further revisions of this score card will be made before it is published.

New tests.—Two new geography tests were devised during the past year. These tests include exercises on information and problems in the geography of Europe and Asia. Professor D. C. Ridgley, of Clark University, and Miss Julia M. Shipman, of Connecticut State Normal School, have collaborated with Dr. Stevenson in the preparation of these tests.

Supply and demand as to home-economics teachers.—An investigation of the supply and demand for teachers of home economics in Ohio has been carried on during the past year. The purpose of this study is to ascertain the number of trained teachers of home economics graduated from the various teacher-training institutions of the state of Ohio during the years 1919–23 inclusive and the type of training received. By this is meant the adequacy of preparation for the work which the student intends to undertake after graduation. The cards used in this investigation have been collected by the Bureau of Educational Research from the teacher-training departments of the various schools and colleges of the state, one card for each graduate, giving as far as possible, the student's training for the type of position, if any, held since graduation. This project will also involve a study of the curricula of the training schools. As a second part of this investigation the demand for teachers of home economics in the state of Ohio will be ascertained. The subjects which they will be asked to teach, the type of school employing home-economics teachers, and other similar problems will be investigated in the process of this study. Miss Alice M. Donnelly is carrying on this project under the direction of Dr. Buckingham.

(1) An article by Miss J. Fuge, "Dramatizing Problems," *Educational Research Bulletin*, 4:158-61, April 15, 1925, was also a part of this investigation.

THE PROJECTS OF THE BUREAU OF EDUCATIONAL RESEARCH FOR THE COMING YEAR

The following projects of the Bureau are announced either to be continued or initiated during the coming year. Those which have been described in the article in this issue, entitled "The Projects of the Bureau of Educational Research for the Past Year," are merely listed by number and name. Those which have been previously announced (*See* issue for September 17, 1924) are recorded substantially as they were then described. Finally, the new projects, of which there are three, are presented somewhat more in detail.

The projects already referred to are:

Project 1. Class-size
Project 6. Child-accounting records
Project 10. State-wide testing program
Project 11. Effective publicity
Project 30. A study of children's interests by means of the questions they ask
Project 40. Remedial instruction in arithmetic based on testing

Project 17. A study of the repeater.—This study will attempt to ascertain the most potent causes of repeating and to find out the extent to which repeating benefits the pupil. Questions of capacity, attitude, health, and home conditions will be taken into consideration.

Project 22. Study of the progress of pupils doubly promoted.—In this study, data are desired on the intelligence, the health, and the social conditions of the children who have received one or more double promotions during the past three years of their school history.

Project 39. Persistence in junior high school.—One of the arguments which has been made for the junior high school is that it increases the holding power of the school and successfully bridges the gap between the elementary grades and the senior high school. This study will attempt to ascertain the facts concerning persistence and the extent to which this may be directly attributed to this form of organization.

Project 41. Learning curve of bright, average, and dull children.—Any curricular organization which is intended to be adapted to the mental ability of children of these three groups assumes a difference in their learning curves. In this project an attempt will be made to determine the extent to which these curves differ and the significant type of curve for each group.

Project 46. The relation of attendance and progress.—The effect of absence on school progress has been a matter of interest to investigators for many years. In the past, however, progress has usually been measured by promotion or by teachers' marks. In this mark, it is intended to consider the progress in terms of accomplishment on standardized tests. A considerable group of one-room rural schools, consolidated schools, and city schools are desired in which children will be given certain tests at the beginning and the close of the school year. These data, together with an accurate statement of the days present and absent, will be of interest to the Bureau.

Project 47. Standards of admission to teacher-training institutions.—This is a status study of the present practice and legal requirements for entrance into the teacher-training institutions of the various states throughout the country.

Project 50. Uniform budgetary and accounting systems for the schools of Ohio.—In this project a study will be made of the existing forms of school accounting together with the items needed to care for legal requirements and to furnish most adequately the information needed by school boards and administrators.

Project 51. A study of state aid.—An attempt will be made to work out a scheme of state aid which is based upon scientific principles.

Project 52. Teaching load in the high schools of Ohio.—This study will endeavor to find the range, variability, and central tendencies with respect to the teaching load in Ohio high schools.

Project 55. For what are teachers paid?—This study will attempt to correlate salary with type of service, with experience, with training, and with teaching load in order to ascertain what principles, if any, seem to govern the pay of teachers.

Project 57. The history and status of organized research in education.—This project will be undertaken during the coming year in order that two purposes may be accomplished. The first has to do with the history of the research movement in education; the second, with its present status.

In education as in agriculture, engineering, commerce, and industry, the demand for research has resulted in the establishment of research organizations. In education these organizations are commonly called Bureaus of Educational Research. Before the principal actors in the development of these bureaus have passed away, and before documentary evidence is lost, it is well that the historical facts connected with this interesting development be recorded. In this project an attempt will be made to do this even to the extent of comparing the movement in this country with the related movements abroad.

This project will also attempt to show the condition of bureaus as they are now constituted. This will include details as to personnel, expenditure, methods of work, and the special lines of investigation or of other service which each bureau is equipped to perform.

Project 58. Minor problems in the teaching of arithmetic.—This year the Bureau will conduct several investigations under this general heading. Some of these will involve the examination of courses of study and textbooks to determine such facts as, "the extent to which counting is taught in the elementary school," "the grades in which arithmetic is begun," and "how fractions are handled in the course of study." Some of them will be pursued through the use of questionnaires such as, "Do adults prefer to add up or down?" and "Do they add or take away when they subtract?" Still others will involve the setting up of controlled experiments, where the participation of school people is solicited. Certain topics are tentatively proposed as follows:

Should addition and subtraction combinations be taught together or separately?

To what extent may a transfer of learning be relied upon between addition combinations and addition by endings?

To what extent may a transfer of learning be relied upon between subtraction combinations and subtraction by endings?

Should children be taught to add up or down?

How may we prevent counting when the pupil is learning or using addition facts?

Should the subtraction combinations be taught as addition or as take-away facts?

The suggested topics are not to be taken as final. Much will depend upon the interest of the school people.

Project 59. Learning difficulty in spelling.—School people who have been using the various spelling scales are accustomed to think that the percents listed for the groups of words within the scale represent spelling difficulty. As a matter of fact, these percents show the accuracy with which children spell these words under unknown learning conditions. In the present project we shall undertake to discover relative

spelling difficulty of a rather large number of words on the basis of the variation in the amount of study required for learning. It will be quite impossible to control all the factors in the situation, but it is believed that, with a sufficient number of cooperating schools, valuable information may be secured.

SUGGESTIONS FOR TEACHING IX-B ALGEBRA

(Continued from page 250)

A CHANCE FOR EXPERT JUDGMENT

In a great many instances one cannot be *sure* what the pupil did in getting a wrong answer, but one can form a very good idea. Consider, for example, exercise 78. It reads:

> In the formula below, find A if $a=12$ inches and $b=18$ inches. $A=\frac{1}{2}ab$.

The answer is 108 square inches. Many pupils got 15. Indeed, this was the most frequent error. It occurred 18 times, and generally without any accompanying computations to show how it was obtained. But in these cases, we can be practically certain what happened. The pupil found ½ of 12, ½ of 18, and *added* the resulting 6 and 9. No harm whatever is done if you assume that this diagnosis is the correct one. It *will* be the correct one in all but an occasional instance. What you will do about it is relatively clear. It is not a difficulty in arithmetic. It is really a difficulty in handling algebraic notation. Drill on the interpretation of quantities like $\frac{1}{2}ab$ is the procedure indicated.

Again, in the same exercise, a few pupils got 54 instead of 108 as the answer. Here the indications are that they found half of 12, half of 18 and multiplied the results—$6 \times 9 = 54$. The trouble, as before, is in the meaning of the symbols.

Even in some of the far-fetched results a little ingenuity will enable you to arrive at a probable inference. Consider, for example, the child who got the answer 3 to the exercise we are considering. Even if he shows none of his work, it is likely that he proceeded in this way. He regarded ab as indicating division—namely, as $\frac{b}{a}$. This would give him $\frac{18}{12}$ which reduced to $\frac{3}{2}$. Then he divides this result by ½ which gives him his answer, 3. To him the symbol $\frac{1}{2}ab$ instead of meaning two operations in multiplication means two operations in division.

The lesson we may learn from such deductions is that every attempted solution which involves error is a clinical picture. In some instances we shall be unable to locate the trouble, except by interviewing the pupil; but in the vast majority of cases we can do so from the paper itself either with certainty or with a high degree of probability. Much depends on our insight; and I know of no way in which we may become expert teachers more certainly than by a study of errors and the application of the necessary remedies.

The *Baltimore Bulletin of Education* for April, 1925, is devoted entirely to the instruction of geography. Experts from several states have contributed articles on methods and materials for geography instruction. The Bulletin is published by the Board of Education, Baltimore, Maryland.

The preliminary reports of a recent survey of the costs of school-building construction in the state of New Jersey during the last four years show that the immediate cost for elementary-school buildings of a larger size is about $335.00 per pupil, while that for small schools is $264.00. The cost for high schools has been $529.00 per pupil. The immediate cost per square foot has been $11.69 for the larger elementary schools, $7.99 for the smaller elementary schools, and $12.44 for the high schools.

EDUCATIONAL READINGS

ASHBAUGH, E. J. *A Bibliography of Research Articles Published in 1924*, *JER*, 11:368-79, May, 1925.

A classified list of 244 titles. This list afforded the basis for the presidential address of the Educational Research Association at Cincinnati, February 26, 1925.

RUGG, L. S. *Retests and the Constancy of the I. Q.*, *JEP*, 16:341-43, May, 1925.

Here is some additional evidence of the relative constancy of the I. Q. based upon the results of 114 pairs of tests, given in grammar schools of West Alexandria, Louisiana. The time which intervened between the two tests ranged from four to thirty-six months, the median range being twenty-one months. The coefficient of correlation was found to be .948. These results are in substantial agreement with the findings of Terman, Garrison, and others.

ALLEN, RICHARD D. *Some Neglected Problems in Classifying High-School Pupils*, *JER*, 11: 351-58, May, 1925.

"A classification of pupils according to intelligence in the junior high schools as well as in the senior high schools should be more than a mere administrative device to increase the efficiency of instruction. It should be a means by which problems can be isolated, studied, and solved—at first tentatively, but as time goes on with greater accuracy and assurance. A guidance program in these schools should make use of individual psychological and educational measurements for purposes of individual guidance as well as for efficient instruction."

BROWN, ROBERT M. *The Attributes of Civilization*, *ER*, 70:1-5, June, 1925.

To base the practical everyday teaching of geography on the principles of sympathetic tolerance and international kindliness is an achievement. A class of Professor Brown's must be a rather fascinating lesson in the humanities. He opposes current emphasis on racial divisions, with the assumed superiority of our own. Geography should "uphold the principles of human brotherhood"; ethnic classification should always be tempered by the charity that comes from understanding and that understanding itself comes from unprejudiced study.

HOLCH, A. E. *The Administration of Student Activities*, *ER*, 70:6-10, June, 1925.

The rich social value of student activities warrants thoughtful planning of their administration. It is always a problem fraught with dangers. The "side show may swallow the whole show," the unfit may become leaders, the best students may be overtaxed. The writer presents a carefully worked out point system, whereby "the various activities are evaluated according to the time they will require of the students," and eligibility for different offices is based on scholarship and other factors.

LEWIS, GRACE T. *Is My Child to Be Debarred from College?* *ER*, 70:26-31, June, 1925.

After asking "How will the college sorting machine separate the chaff from the wheat?" the writer goes on to a discussion of tests and entrance examinations and gravely questions their validity in barring students from college. Her particularly hostile criticism is leveled at the system of early application prevailing in Eastern colleges and at what she considers artificial standards of admission, leading to an "aristocracy of brains." She does not recommend the removal of selective machinery, but its improvement, a less objective discrimination. The problem, of course, is interesting, but considerably more complicated than the article indicates.

SHELLOW, S. M. *A Suggestion for an Experiment on the Effect of Note-Taking in Lecture Courses*, *JAP*, 9:69-73, March, 1925.

The author tried out a plan of having her class refrain from note-taking during the lecture hour, except for the last five minutes when time was allowed for writing down the main points from memory. The instructor found the teaching to be more effective as the students were looking at her and she could tell when points had not been made clear. Of the thirty-five students in the class twenty-two were in favor of this method after they had given it adequate trial; ten were indifferent as to its value, while only three found themselves hindered. It is suggested that controlled experiments should be carried out in investigating this general matter of note-taking methods.

MAY, MARK A. *The Present Status of the Downey Will-Temperament Tests*, *JAP*, 9:29-52, March, 1925.

This article begins with a description of the tests themselves and goes on to a discussion of their validity and reliability. The author uses some material of his own, but for the most part refers to results published by others. From all sources the reliability seems low, due possibly to inadequate methods of measuring reliability; too many subjective elements in the tests; or unreliability of the responses themselves. In checking

NOTE.—The abbreviations used in this number are: *JER*, Journal of Educational Research; *JEP*, Journal of Educational Psychology; *ER*, Educational Review; *JAP*, Journal of Applied Psychology; and *SR*, School Review.

validity several methods were used—correlation with estimates, correlation with other tests, identification of profiles, differentiation of result by delinquent from non-delinquent boys, sane persons from insane, or negroes from whites, and the prognostic value of the tests in predicting behavior disorders. By none of these methods do the tests seem to have more than a slight degree of validity. The general conclusion seems to be that these tests are to be considered as merely experimental. Especially is it pointed out that character is, in terms of the newer psychology, primarily *conduct* and that these tests are not measuring conduct. The article ends with a considerable bibliography of references in the field of character study.

ODELL, C. W. *High-School Marking Systems*, SR, 33:346-54, May, 1925.

This article presents the findings of a survey of the situation which exists among 281 four-year high schools in Illinois in respect to their marking systems. So diverse are the schemes employed that the reader in perusing the report is reminded of the directory of broadcasting stations. The author holds that in this respect Illinois is no more than representative of many other states. All this leads to the conclusion that there should be a standardization of marking systems which might make universally intelligible interpretation of high-school marks. It is suggested that some accredited body, such as the North Central Association, promote the movement. Quite naturally, the author is proposing a scheme of marking upon the normal curve, but warns against a purely mechanical application of its principles. He insists that due allowance should be made for circumstances.

LAYCOCK, S. R. *The Laycock Test of Biblical Information*, JEP, 16:329-34, May, 1925.

The author holds that a quantitative determination of the extent of biblical information seems to be a prerequisite to any attempt at the solution of the question of the educational policy to be pursued in moral instruction, in spite of the fact that we are unable to say as yet just what significance, for moral and religious development, is to be attached to such knowledge. Therefore, an objective performance scale was devised and standardized to afford a truer estimate of the relative number of biblical facts held by pupils of different ages and grades. The tests were standardized on grades VII, VIII, and IX as bases; 1,115 cases being involved between the age limits of eleven years six months and sixteen years five months. The investigation, as a whole, brings out the fact that the children involved in the test, on reaching the age at which many leave Sunday school, have a very inadequate knowledge of the Bible and that the present methods of religious teaching, at least so far as Protestant denominations are concerned, seem to be securing paltry results.

OSBURN, W. J. *The Supervision of Teaching in Geography*, JER, 11:337-43, May, 1925.

A reason for inadequate supervision in geography is the lack of agreement as to what constitutes the minimum essentials in this subject. A survey of examination questions revealed a great preponderance of "where" and "name" questions. A list of 603 elements, occurring five or more times in these questions, is proposed as a tentative statement of minimum essentials.

O'BRIEN, F. P. *The Vocabulary of High-School Pupils in Written Composition*, JER, 11:344-50, May, 1925.

Approximately ninety percent of the words used by high-school pupils in writing a composition on an interesting topic was found in the first thousand of the Thorndike list. Words pertaining to abstract qualities or ideas and descriptive or definitive adjectives were rarely used.

IN PAPER COVERS

Educational Publicity in the Public Press. Seattle, Washington, Washington Education Association, 1925. 27 pp.

This manual constitutes an interesting addition to the growing literature in the field of school publicity. Its purpose is to provide a few suggestions as to procedure in keeping the public in closer touch with its schools. To that end the major problems of selecting, delivering, and apportioning the news, the kinds of school news the papers want, and so on, are covered. Busy superintendents will find this booklet valuable.

WYNNE, JOHN P. *Guide to the Principles of Educational Methods.* Farmville, Virginia, State Teachers College, 1925. 87 pp.

This pamphlet contains twenty-one topics in principles of education under each of which a number of questions are given. A list of references is given on each topic. The outline is not as practical as some of the other outlines of this sort which have already appeared.

YOUNG, WALTER H., TOWLE, CLIFTON A., PITKIN, FRED E. *Teaching the Fundamentals in Secondary Schools.* New Hampshire, State Board of Education, 1924. 17 pp. (Series 1924–25, No. 114)

High-school teachers frequently criticize the elementary school because its former pupils are not satisfactorily proficient in the fundamental processes of education. Realizing this the Superintendent's Committee on Fundamentals for the State of New Hampshire has set up certain goals to be attained in spelling, handwriting, grammar, silent reading, and place geography. Standards for each of the high-school grades are suggested and a time schedule with suggested motives is given. References which will prove helpful to the

teachers are also listed. This brief outline of minimum essentials will be a valuable addition to the library of any high-school teacher.

NEALE, M. G. *A School-Building Program for Columbia, Missouri.* Columbia, Missouri, University of Missouri, 1925. 70 pp.

NEALE, M. G. *A School-Buildnig Program for Joplin, Missouri.* Columbia, Missouri, University of Missouri, 1925. 75 pp.

These surveys by Professor Neale of the School of Education, University of Missouri, discuss the present school-building situation in each of the cities named, estimate the future school enrollment, propose a building program, and make suggestions for the financing of the program. Both of these surveys are liberally illustrated with graphs and tables.

ODELL, CHARLES W. *Educational Tests for Use in High Schools, Revised.* Urbana, University of Illinois, 1925. 20 pp. (University of Illinois Bulletin, Vol. XXII, No. 37)

Tests for the use in the high school are grouped by subject in this pamphlet. Each test is briefly described, its various forms are listed, and the name and address of the publisher together with the price per hundred copies are given.

LOOMIS, ALICE M. *The Mother as a Teacher.* Lincoln, Nebraska, Author, 1924. 48 pp.

This pamphlet grew from lectures on Mother Training and Home Management. With the focus of present attention on the pre-school child, the teaching function of the mother and her need for preparation in that function should increase interest. The methods set forth—telling, showing, illustrating, experiencing—are psychologically sound. Example is piled upon example in an informal, chatty fashion.

MICHIGAN STATE TEACHERS' ASSOCIATION. *A Uniform Financial Procedure for the Public Schools of Michigan.* Lansing, Michigan, Department of Public Instruction, 1924. 40 pp.

Within the pamphlet is presented a uniform system of financial records and procedure which by the order of the superintendent of public instruction will be used in all the schools of Michigan during the regular school year 1925. Numerous blanks are provided and a detailed definition of all terms to be used is given in each case.

BOOKS TO READ

TROW, WILLIAM CLARK. *Scientific Method in Education.* Chicago, Houghton Mifflin Company, 1925. 159 pp.

Here is an argument for the scientific method in the study of educational problems which never descends from the plane of scholarly effort and seems adequately to meet for all time contrary empirical arguments. What are the sources of the scientific method? They are traced. What cautions should be observed? They are enumerated. Why should there be a scientific method? The reasons are given. All in all, the author is sane in his presentations, and strikes a firm note where there has been so much controversial discord. The volume is an essential addition to every professional library.

SCOTT, CHARLES EDGAR. *Educational Supervision.* Milwaukee, Bruce Publishing Company, 1924. 98 pp.

Within this short compass the author lays down certain principles of educational supervision and illustrates certain aims. He has combined quotations from other authors with his own experiences in a monograph which is well fitted for the group for whom it was prepared.

OPPENHEIMER, JULIUS JOHN. *The Visiting-Teacher Movement with Special Reference to Administrative Relationships.* New York, Joint Committee on Methods of Preventing Delinquency, 1925. 206 pp. (Publication No. 5)

The history of the development of the visiting-teacher movement and the reasons underlying this movement form the opening chapters of this book. The problems of administering visiting-teacher service and the relation of the visiting teacher to the school and to various social agencies are considered, and the work of the visiting teacher and her necessary qualifications and training are discussed in some detail. The appendix contains a questionnaire on the administrative relationships of the visiting teacher and the tables summarizing the replies.

HAMAIDE, EMILE. *The Decroly Class.* A contribution to elementary education translated by Jean Lee Hunt. New York, E. P. Dutton & Company, 1924. 309 pp.

Theories of education are continually being applied in practice. Decroly believes that education should be concerned with the present interests and activities of the child. Although his opinions are similar to those of John Dewey they have been arrived at independently. In this book the progress of a group of children in the primary grades of the public schools at Brussels in which the Decroly method was used is described.

SAYLES, MARY B. AND NUDD, HOWARD W. *The Problem Child in School.* New York, Joint Committee on Methods of Preventing Delinquency, 1925. 287 pp. (Publication No. 4)

The larger part of this book is concerned with narratives taken from the case records of visiting teachers at work under the direction of the National Committee on Visiting Teachers as a part of the Commonwealth Fund Program for the Prevention of Delinquency. "The Purpose and Scope of Visiting Teacher Work" is discussed in a short chapter toward the close of the book.

Superintendent J. L. Ward, of Bucyrus, has just distributed the mimeographed report of the mid-year test survey made in the schools of that city. The tests used in grades III to VI were: the Ayres Spelling Scale; the Ayres Handwriting Scale, Gettysburg edition; the Woody-McCall Mixed Fundamentals in Arithmetic; the Buckingham Scale for Problems in Arithmetic, and Monroe's Silent Reading Test. The Stevenson Problem Analysis Test was used in the higher grades and the composition test used was the Nassau County Supplement to the Hillegar Scale.

The National Committee for the Prevention of Blindness will organize classes for the training of teachers and supervisors in sight-conservation instruction. The complete program of instructional, observational, and clinical work will be offered at Cincinnati University.

Through the efforts of the Education Section of the National Safety Council about seventy important schools throughout the country have been organized as demonstration centers for safety education in addition to the hundreds of other schools that are doing something along this line.

The Education Section publishes an eight-page semi-monthly Bulletin for teachers that is devoted entirely to the furnishing of actual classroom material for safety instruction, together with a Manual and other similar matter.

Plans are being made for an annual two-day conference of the workers in the safety-education field on the Friday and Saturday preceding the meeting of the Department of Superintendence.

The Education Section, beginning with September, will, in addition to its home office force, have three Field Secretaries giving their full time to the organization of safety-education work in the schools.

The Advisory Committee of the Education Section consists of P. P. Claxton, E. P. Cubberley, S. P. Duggan, C. H. Judd, William McAndrew, A. B. Meredith, Harold Rugg, and Payson Smith.

NEW MEMBERS ON THE STAFF

Mr. Samuel S. Brooks has been appointed Research Assistant to fill the vacancy caused by the resignation of Mr. Ralph Livingston. Mr. Brooks, a native of Maine and a graduate of the University of Maine, has filled various teaching or administrative positions in Maine and New Hampshire. Mr. Brooks made himself known to the school people of the country through his series of articles on the use of standardized tests in school supervision which were published in the *Journal of Educational Research* in 1920. This material was later published in book form by Houghton Mifflin Company under the editorship of Dr. Buckingham.

Miss Dorothy Wall, who graduated as an honor student in English at the University of Michigan in June of this year, has been appointed Editorial Assistant. During her senior year, she taught in the University High School, one of the leading schools of this type in the country. This appointment brings to the Bureau an additional person particularly fitted by specialized training to assist in the heavy work of the Editorial Division.

By action of the Board of Trustees in June, the Appointments Bureau headed by Professor Clifton was transferred to the Bureau of Educational Research. In order that the work of the Bureau may be carried on even more effectively than in the past, Miss Adelaide R. Gardner, a graduate of Ohio State University, has been appointed secretary. Miss Gardner's record in the University together with her experience in the secretarial field since graduation fits her especially well for the duties of this new position.